Appendices

August 28, 1987

APPENDIX A

STANDARD TRAFFIC METHODOLOGY

INTRODUCTION

Traffic impact studies submitted by the City of Rockville shall comply with the following Standard Traffic Methodology. Traffic impact studies are required of the following development applications:

- All local map amendments not in conformance with the approved and adopted Master Plan.
- All applications seeking to utilize "special development procedures" permitted by the "Zoning and Planning Ordinance."
- All applications for preliminary subdivision plans involving more than 100 dwelling units.
- All use permit applications that will produce or attract more than 100 additional trips during the AM or PM peak hour, whichever is greater, using the trip generation rates as described herein.
- All special exception applications that will produce or attract more than 100 additional trips during the AM or PM peak hour, whichever is greater, using the trip generation rates as described herein.

A traffic study prepared in accordance with the standard methodology earlier in the development approval process will not need to be resubmitted at subsequent steps provided that two conditions are satisfied. First, the elapsed time from initial acceptance of the original transportation impact assessment to the latest application cannot exceed three years. If this time limit is exceeded, an updated or revised assessment must be prepared. The second condition which would require the preparation of a new transportation impact assessment is a change in site characteristics (e.g., development size, land use mix, access configuration). The Planning Director will determine if site characteristics have been changed sufficiently to warrant a revised assessment.

All traffic studies submitted in support of applications for land development will consider existing traffic conditions as well as the probable impacts of the requested action. Approved nearby development must be considered in light of the time frame in which it is expected to occur. Anticipated growth in background traffic must also be considered. The forecast of development activity (developed by the Planning Department) will be useful in projecting future traffic volumes. Programmed roadway

improvements may also be considered, provided they will be completed and open to traffic when the development is occupied.

GUIDELINES FOR TRANSPORTATION IMPACT ASSESSMENT

The following procedures, analytical techniques and general criteria will be used by applicants or their designees in transportation impact studies submitted to the City. If the applicant has any questions regarding required procedures, the City Planning Director shall provide the necessary guidance.

Step 1. Initial Meeting

It is recommended that the applicant meet initially with appropriate City staff prior to the preparation of the site transportation impact assessment. The initial meeting will provide the applicant the opportunity to discuss the detailed report requirements as they apply to their site. For example, City staff will provide guidance on the appropriate boundaries for the site impact area. In addition, City staff will provide necessary traffic and land use information for the impact area, if available.

Step 2. Impact Area Definition

An initial assessment of the area which will have traffic impacts from the proposed development must be made. The size of the impact area affected by the proposed development will depend upon the size of the development, the configuration of the roadway system, natural or man-made barriers, and the adjacent existing and proposed land uses. At a minimum, the impact area will include the next immediate signalized intersection(s) along the principal access route(s). The impact area shall not be limited to City boundaries. As the analysis proceeds, it may be necessary to modify the size of the impact area. This determination will be be made by the Planning Director or his designee.

The Mayor & Council, Planning Commission or Board of Appeals will be notified of the study area determination as an information item. Appeals of administrative actions shall be made to the Planning Commission, with a report from the Traffic and Transportation Commission.

Step 3. Inventory/Data Collection

Within the defined site impact area, the following data must be collected and reported in the transportation impact assessment document.

Roadway System Characteristics

All roads within the study area must be shown on a map. The scale of the map(s) shall be appropriate to size of the site and of the impact area and be acceptable to the City. Roadway projects programmed and funded for completion at the time of

development occupancy (according to City, County and State Capital Improvement Programs) should be included. The number of lanes of each roadway shall be indicated and on the same or separate sketch, the movements permitted by lane for all intersections. Types of intersection controls in place should be noted; as should median openings, vertical and horizontal alignment (if irregular), and location of existing access points if they have a direct effect on roadway capacity or traffic flow.

Land Use

A complete summary of proposed gross square footage, for both the site and for approved but unoccupied development (within the impact area), must be provided for each category of land use. A summary of any other land use information to be considered must also be provided. This information will be needed to address questions regarding access, directional distribution and growth in traffic. The City Planning Department will provide information on approved but unbuilt development in the impact area within the City. It shall be the responsibility of the applicant to obtain information on approved but unbuilt development in Montgomery County.

Traffic Counts

Recent traffic counts must be shown for all roadways in the impact area. Counts of turning movements at intersections should be included for all intersections adjacent to the site and all signalized intersections in the impact area. Counts may be available from the State Highway Administration, the City and Montgomery County. Traffic counts shall not be used if more than three years old and the use of counts greater than one year old must be approved by the City. Traffic counts should be adjusted using seasonal adjustment factors. Traffic counts collected during the months of August, December and the first two weeks of September will not be accepted due to wide variations in traffic patterns during these time periods. In the event recent traffic counts are not available, the applicant will be responsible for data collection. Conflicts between differing traffic count sources will be settled by the Director of Planning. Historical traffic data must be adjusted to reflect current year traffic volumes and patterns.

Transit

The availability of public or private transit service should be noted in the inventory. The location of bus routes, bus stops, frequency of service and hours of operation should be noted when applicable.

Traffic Accident Data

Traffic accident data will be included in the study if deemed necessary by the Director of Planning.

Step 4. Background Traffic

Background traffic includes all existing traffic in the impact area plus all growth in traffic generated solely by land uses outside the impact area. Growth in background traffic should be estimated before the impact of traffic from the proposed development is evaluated. Background growth in traffic may be calculated by either extrapolation techniques or use of data obtained from application of areawide forecasting models. The technique utilized should be decided after consultation with City staff. City staff may be able to provide data from previous applications of areawide travel forecast models such as T.R.I.M.S.1/

Background traffic estimates will need to be prepared for all time frames for which a site impact assessment will be conducted. Refer to Step 6 for a discussion of the appropriate assessment time frames.

Step 5. Traffic Generated by Approved but Unbuilt Development

The growth in background traffic which was computed previously in Step 4 will not reflect the additional traffic generated by approved but unbuilt development located within the impact area. The basis for the traffic forecasts in this step will be the transportation impact assessments (or comparable) prepared for the sites. It will be the responsibility of the City to provide these forecasts to the applicant. Any decision on how these forecasts should be adjusted to reflect the design year(s) for the site being assessed should be made in consultation with the City Planning Director.

Step 6. Site Traffic Estimation

In order to develop an estimate of the traffic generated by the site being assessed, a four stage process involving trip generation, modal split, trip distribution, and traffic assignment should be followed. If full build-out of the site is anticipated within a five-year period, the site traffic estimation step (and subsequent analysis steps) should assume a design year of five years from the date of the report. If the site is anticipated to be developed in major stages or over a greater than five-year time frame, multiple traffic estimates (and therefore multiple assessments) will be necessary. If staging is known, the traffic estimates and assessments should be made at key stage points. If detailed staging is not known, traffic estimates and assessments at the project midpoint and at full build-out should be prepared.

1/T.R.I.M.S. is an acronym for a Transportation Integrated Modeling System used in the travel forecasting process by the Metropolitan Washington Council of Governments.

Trip Generation

The latest edition of the Institute of Transportation Engineers (ITE) "Trip Generation: an Informational Report" (Third Edition) will be used s the primary source of trip generation factors for all land uses.1/ Trip generation rates for any uses not cited in the ITE Manual may be estimated using other available sources of information, with approval from the Director of Planning or designee. All traffic studies will consider AM and PM peak hour trip generation. When the peak hour of the generator occurs at a time differing from the peak hour of the adjacent street, site-generated traffic volumes will be computed separately for both the peak hour of the generator and for the peak of the adjacent street. For informational purpose a computation of daily traffic generation should also be made and included in the applicant's report.

Gross trip generation may be reduced by considering significant on-site existing land use activities that are to be eliminated via redevelopment. Such negative generation may be incorporated into the total generated traffic volume. To be eligible for this reduction, the existing land use must be active at the time that traffic counts are performed in the area.

For commercial retail development only, the applicant may make reasonable assumptions regarding pass-by traffic. Pass-by percentages of up to 50% maximum may be selected after consultation with the Director of Planning or his designee. While pass-by volumes may be used to reduce the gross generated traffic volume, they must be considered in further methodology steps and for evaluating their effect on driveway design and other circulation elements. Pass-by percentages shall not be used to reduce parking or other on-site requirements, or to determine the threshold level for performing a full traffic impact study.

The ability to use transit or other transportation modes for site-generated trip should not be considered during this stage of the process. Neither should potential reductions in trip generation for mixed use development be computed at this stage.

Modal Split

Assumptions regarding the amount of transit use and/or ride-sharing to and from the proposed development must be documented in all traffic studies submitted. The initial modal split assumptions should correspond to the most accurate and verifiable data for the surrounding area. Some recommended sources of information on this subject include: the 1980 Census of Travel or its successor, patronage summaries developed by the Washington Metropolitan Area Transit Authority, the Montgomery County Department of Transportation, the Maryland-National Capital Park

1/ Trip Generation, Third Edition, Institute of Transportation Engineers, 1982.

and Planning Commission, or the Metropolitan Washington Council of Governments. Any assumptions based on recent changes in the supply of transit service must be clearly presented along with supporting data. Modal split assumptions must be approved by the City Planning Director or his designee.

Reduction in vehicle trip generation due to pedestrian activity within mixed-use developments should be computed at this stage and approved by the City Planning Director or his designee. Reductions may be based on regional or local survey data and the proximity of various land uses.

Trip Distribution

For developments of a predominant single use, percentages of traffic entering and leaving the site and/or study area may be distributed based on forecasted directional traffic characteristics of adjacent roadways. For mixed-use developments, it may be necessary to distribute residential, shopping or work trips separately using a gravity model or other distribution model. Regional trip tables produced by the Metropolitan Washington Council of Governments may be used as a basis for the distribution of trips. City staff will assist the applicant or designee in obtaining this information.

Traffic Assignment

Site-generated traffic volumes should be assigned to the roadway network within the impact area using the distribution factors previously developed. Assignments should be made according to "shortest path" methods. Assigned traffic volumes should be divided into four components: Background / Approved but Unbuilt / Site / Total.

Step 7. Evaluation of Traffic Flow

During this step, evaluations of existing traffic conditions and of forecast year traffic conditions with the site are conducted. The results of these evaluations will be reported in terms of facility volume/capacity ratios and levels of service. These concepts are described in more detail in Appendix A.

Capacity Analysis

In Rockville, system capacity is generally governed by the capacity of individual signalized intersections. Levels of service shall therefore be determined for all signalized intersections in the impact area, using the Critical Lane Analysis technique. The following penalties and multipliers must be used to apply critical lane analysis techniques:

TABLE 1

CRITICAL LANE ANALYSIS - PENALTIES AND CAPACITIES

1. LANE DISTRIBUTION:

2 lanes: 52.5/47.5
3 lanes: 36/34/30

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2. LEFT TURNS:

Lane Use:	Exclusive Lane	Exclusive Lane	Shared Lane	Shared Lane
Signal:	Exclusive Movement	No Exclusive Movement	Exclusive Movement	No Exclusive Movement
		Opposing Traffic (vph)		Opposing Traffic (vph)
Multiplier:	1.1	0 1.0 1-300 1.3 > 300 1.6	1.3	0 1.3 1-300 1.6 300-600 2.5 600-1000 4.0 > 1000 6.0

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3. DOUBLE LEFT TURN: Multiply full volume by 0.6 (accounts for both lane distributribution and left turn penalty).

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4. RIGHT TURNS:

Radius	Multiplier
15'	1.3
15'-25'	1.1
25'	1.0

With unknown geometrics, use 1.1 urban areas.
With unknown geometrics, use 1.0 suburban areas.

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5. PEDESTRIANS: For intersections where pedestrian signals exist or pedestrian traffic is expected, minimum pedestrian crossing times must be equated to critical lane volumes.

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6. GRADES: On an approach with a grade judged significant, multiplier is 1.1 (combines with all other factors)

Capacity: 100% = Level of Service "F" *Levels of Service - % of Capacity

Cycle (sec)	No. of Phases 2	3	4
60	1500	1400	--
90	1600	1500	1400
120	1650	1600	1500

* A = 60%
* B = 60 - 70%
* C = 70 - 80%
* D = 80 - 90% (max.allowable)
* E = 90 - 100%

For other factors and penalties (buses, greater than five percent trucks, etc.) refer to TRB Special Report 209. If phasing and cycle lengths are unknown or cannot be determined (i.e., future locations of signals), use C.L.V. of 1500.

Application of the Critical Lane Analysis techniques generally requires professional assistance (consultant traffic engineer, planner, or City staff). Further guidance may be obtained from Transportation and Traffic Engineering Handbook (2nd edition) 1/ and other transportation textbooks.

For both intersections and roadway links in commercial areas that exceed the threshold value between levels of service D and E (LOS D/E), which represents 90% of theoretical capacity, should be identified (see step 8). Traffic operations below this level of service are unstable and mitigating options should be identified. In all other areas of the City (excluding residential streets), level of service C/D (80% of theoretical capacity) should be the point at which impacts are noted. As will be noted, level of service is not the only measure for determining the need for transportation improvements.

As part of the evaluation step, it may be necessary to perform additional special studies in order to identify roadway deficiencies not directly evident from the level of service calculations. These include traffic signal studies, turning lane studies, and accident studies.

1/ Transportation and Traffic Engineering Handbook (2nd Edition), Institute of Transportation Engineers, 1981.

Traffic Signal Studies

The purpose of such studies will be to determine the need for a traffic signal at access points or other nearby non-signalized locations. 1/ This requires a 12 hour turning movement count or estimate (for the forecast year and including site-related traffic) and the comparison of these hourly figures with the warranting values contained in the Manual on Uniform Traffic Control Devices.2/ At access points where a traffic signal already exists, the applicant shall be responsible for determining all necessary modifications to the existing signal due to site-generated traffic so that it operates in a safe and efficient mannner.

Turning Lane Studies

Turning lane studies shall be conducted to determine the adequacy of turning lanes for handling forecasted traffic volumes without interference to adjacent travel lanes. For signalized and unsignalized intersections, the length of left turn lane(s), in feet (not including taper), must equal or exceed the number of left turns per peak hour per lane. The need for right turn lanes shall also be reviewed. In no case shall the length of a turn lane be less than 100 feet (not including taper).

Accident Studies

Accident studies may be necessary at locations with a history or expectancy of safety problems. Such locations will be identified by the City staff. The applicant will be expected to identify suitable countermeasures to deal with safety problems, whether documented by accident experience or expected to occur. Such studies shall be noted in the final staff report.

Other Studies

Other special traffic studies may be necessary in order to address potential site accesss problems. These may include problems regarding driveway design and locations, weaving sections, pedestrian access and safety, medians and median openings, service drives, geometric design, signs and markings and streetlighting. If residential streets are affected by the proposed development, the guidelines presented in Appendix A should be followed.

1/ This requirement may change if the State of Maryland adopts new signal warrants.

2/ Manual on Uniform Traffic Control Devices for Streets and Highways, U.S. Department of Transportation, Federal Highway Administration, 1978 as revised.

Step 8. Evaluation of Impacts

Upon completion of the preceding requirements for analysis of the impacts of proposals to develop or redevelop land in Rockville, a summary of all impacts must be developed and included in the assessment report. The following conditions, as determined for all locations within the defined impact area, shall constitute significant and notable impacts:

- Any deterioration of one level of service (0.10 v/c) or greater.
- Any condition that results in the level of service thresholds (D/E - 0.90 v/c in commercial areas, C/D - 0.80 v/c in other areas) being exceeded.
- For locations at which the level of service for background traffic exceeds the thresholds, any further deterioration in level of service.
- Any exceeding of the City's criteria for traffic volumes on residential streets.
- Any condition that contributes significantly toward the need for, or modification to, a traffic signal as established in the Manual on Uniform Traffic Control Devices, or determined by the Planning Director or designee.
- Any conditions in which the capacity of a turning lane is exceeded as established in the Manual on Uniform Traffic Control Devices, or determined by the Planning Director or designee.
- Any condition contrary to principles of proper design and location for driveways, medians and median openings, service drives, and similar facilities.
- Any condition creating or aggravating a safety hazard.

All impacts must be noted in the assessment report and should be arrayed in a chart listing impacts on the left with intended mitigating actions on the right.

Step 9. Development of Mitigating Actions

Based on the defined traffic flow conditions, mitigating actions which would negate or reduce the negative impacts of the proposal on the transportation system will be developed. Mitigating actions can consist of physical improvements which will add capacity to the transportation system (such as the construction of a new road) or programatic initiatives (share-a-ride, transit passes, shuttles to Metro, preferential carpool spaces and vanpooling).

Mitigating actions will be evaluated for their ability to reduce anticipated impacts. "Discounting" prior to preparation of the required summary of impacts and deficiencies will not be allowed. Further, appropriate guarantees of completion or performance will be required as a condition of consideration of mitigating actions. The feasibility of the necessary mitigating actions should be evaluated as part of the assessment report. The mitigating measures should be described verbally and displayed graphically in the assessment report.

Every attempt should be made to identify feasible mitigating actions which would result in standards contained herein being satisfied. Where the City standards cannot be achieved, this should be so indicated in the assessment report. In addition to mitigation actions for actual impacts, the applicant may be obligated to contribute toward the improvement of transportation and safety facilities located adjacent to the site, whether or not the proposed development creates negative impacts. Any improvements of this kind, as requested by the City, would be expected to be commensurate with the magnitude of the development.

Step 10. Preparation of Assessment Report

The applicant is required to prepare a transportation impact assessment for the site which documents the assumptions, procedures, and analyses results for the evaluation steps described above. A suggested outline and a brief discussion of their required minimum content follows. The report should be printed single-sided on 8-1/2 x 11 pages. The City shall provide the applicant guidance on the required number of report copies (which shall not exceed 20). All traffic-related data utilized in the assessment should be included in an appendix. An outline of the required figures may be found in Appendix B.

A. Introduction

The introduction should clearly identify the land use and transportation setting for the site and its surrounding area. The work conducted in Step 2 as well as a portion of the Step 3 inventory (described previously) should be documented in this chapter. The site description should include brief descriptions (text and maps) of the land parcel (its size, general terrain features and location within the City), the roadway network (both existing and planned) within the defined impact area, and existing and proposed land uses within the impact area. This chapter should also include a complete description of the proposed site development.

B. Analysis of Existing Conditions

The inventory traffic data collected in Step 3 and evaluated in Step 7 should be reported in this chapter. The report should illustrate on an impact area map (1) the existing daily traffic volumes within the impact area and (2) the peak hour volumes and

intersection turn movements at all intersections within the impact area. The analysis of existing conditions (i.e., level of service analyses) should likewise be presented graphically as well as documented in appendix worksheets.

C. Analysis of Forecast Conditions

This chapter of the report will present the traffic forecasting conducted in Steps 4, 5, and 6 and the evaluation of forecast conditions performed in Step 7. Included in this chapter should be figures which illustrate, at the minimum, the following information:

- The assumed distribution and assignment of vehicle trips generated by the proposed development (daily, AM peak, and PM peak);
- The forecast link volumes and turn movements within the impact area divided into Background / Approved but Unbuilt / Site / Total Components; and
- The assumed lane geometry and number of signal phases for intersection analyzed as well as the computed critical lane volume, volume-capacity ratio, and level-of-service.

All steps within the forecasting process should be fully documented in the text and related tables. At the minimum, this information must include descriptions of the background traffic growth, "approved-but-unbuilt" forecast assignments, proposed site trip generation assumptions, proposed site modal split, and procedures used to distribute and assign site-generated vehicle trips. The locations with deficiencies at the forecast year(s) will be so noted in map form.

D. Mitigating Actions

Full documentation of the potential mitigating actions developed and evaluated in Step 8 shall be provided in this chapter. If possible, a map illustrating the impact of potential mitigating actions should be included. This map should graphically depict proposed modifications to existing or planned roadway configurations. The transportation impact assessment should be detailed enough to confirm the feasibility of proposed mitigating actions and should present the commitment of the applicant to provide these measures as appropriate. Final functional plans for roadway improvements should be submitted at a later stage in the site development approval process.

E. Conclusion

A conclusion or executive summary should be included within the report and should be a clear and concise summary of the report findings and recommendations.

F. Submission of Report

The applicant shall submit the traffic impact study, as outlined above, at the time of application filing. Revisions to the traffic impact study, if necessary, must be submitted at least 21 days prior to the scheduled meeting date of the appropriate body.

Step 11. Staff Review

Upon submission of a traffic study, the staff shall review the application for compliance with the Standard Methodology for Traffic Impact Assessment. The staff shall prepare a report concerning the impacts on the transportation system resulting from the proposed development including cost estimates, shall be included in the Planning Department's comprehensive staff report. The staff review shall include a summary of the existing traffic conditions, impacts of the development proposed mitigation and unmitigated impacts.

Step 12. Action by Appropriate Body

The traffic impact assessment is evaluated along with other staff recommendations for the application.

APPENDIX A

GLOSSARY OF TERMS, LEVEL OF SERVICE CALCULATION PROCEDURE, AND RESIDENTIAL STREETS

GLOSSARY OF TERMS

The following is a list of commonly-used terms in the report text and their definitions.

Term	Definition
Cycle	- The maximum number of vehicles which can pass a given point during one hour under prevailing roadway and traffic conditions.
Cycle	- The time period required for one complete sequence of signal indications.
Level of Service (L.O.S.)	- A set of operating conditions describing the ability of a road network to handle traffic.
Modal Split	- The percentage of people using a certain means of transport; auto, transit, walk.
Phase	- A part of the cycle allocated to any traffic movement or any combination of traffic movements.
Traffic Control Device	- Any sign, signal, making, or device placed or erected for the purpose of regulating, warning, or guiding vehicular traffic and/or pedestrians.
Trip	- A one-way movement.
Volume/Capacity Ratio (V/C)	- The ratio of an actual volume to the capacity at a given level of service.

LEVEL OF SERVICE DETERMINATION

"Level of Service" (L.O.S.) is expressed in terms of six levels (A-F) and is defined as follows:

Level of Service	Description
"A"	Condition of uninterrupted traffic flow with no delays. All signal phases are sufficient to clear all approaching vehicles.
"B"	Stable traffic flows, characterized by very little delay. Most signal phases are capable of handling approaching vehicles.
"C"	Condition of stable traffic flow. Delays are limited, full use of peak direction signal phase is experienced.
"D"	Traffic conditions are approaching unstable flows. Delays are moderate, signal deficiencies are experienced for short periods of time during the peak traffic period.
"E"	Condition of unstable traffic flow, delays are significant and signal timing is generally insufficient. Congestion exists for extended duration throughout the peak period.
"F"	Condition of forced flows or a break-down in the flow of traffic. Stop and go patterns or waves in the stream of traffic occur.

For additional descriptive information, please refer to The Highway Capacity Manual (Special Report #209), Transportation Research Board, 1985.

Signalized Intersections

Calculation of levels of service for signalized intersections should be based on the Critical Lane Analysis technique documented in TRB Circular 212.[1/] The critical lane analysis adjustment factors for turn movement penalties and the intersection

capacity thresholds are listed in Table A-1. TRB Special Report #209 should not be used except as noted. At unsignalized intersections, a two-phase signal operation may be assumed.

Roadway Segments

In those cases where flows are uninterrupted or where intersections are not the controlling element of the roadway system under study, service volumes should be computed and compared to the following table:

Level of Service	Critical Range (Vehicles per lane per hour)
A	1,000 or less
B	1,000 to 1,150
C	1,150 to 1,300
D	1,300 to 1,450
E	1,450 or more

RESIDENTIAL STREETS

It is City policy not to allow non-residential development which will result in increases in traffic volumes of greater than 10 percent on any classification of residential street. Further, maximum acceptable limits (traffic volumes) have been established for various classifications of residential streets. These limits are:

Secondary residential streets ..... 2,000 ADT
Primary residential streets .....10,000 ADT

The limits cited above are applicable to traffic generated by all development; including residential development. The classification of all City streets is specified in the City's Master Plan.

APPENDIX B

List of Required Figures:

1. Map of study area.

2. Distribution of site generated trips

3. Site access location and design

4. Existing peak hour traffic volumes and turning movements

5. Existing plus background and approved but unoccupied development generated traffic volumes and turning movements.

6. Total: Existing, background, approved but unoccuplied plus site generated traffic volumes and turning movements.

7. Total plus mitigation volumes and turning movements for modified intersections.

8. Summary table: To include volume/capacity ratios of all intersections for the above scenarios.

9. Any figures required for special studies.

APPENDIX B

ACCESS MANAGEMENT PLAN

JHK & ASSOCIATES

This appendix primarily discusses the applications of driveway locations and design techniques in the study area. The median design proposed in this study will control left turns into and out of driveways and minimize the conflicts they now create. The easement along much of this study area provides the property access circulation of "service drives." That circulation is essential for an effective application of driveway location and design control. However, these "service drives" will be most effective if they only are used to consolidate and combine existing driveways to/from Rockville Pike.

The key driveway location and design access controls appropriate for the study area are:

- Spacing between driveways
- Distance from intersections to adjacent driveways
- Geometric design elements: width, curb radius approach angle, slope and vertical curvatures when needed

Design standards for these controls were defined in a 1982 FHWA research report.[1] Standards in that report were used in the preparation of the sketch plan for improved driveway access shown in the plan sheets (photos).

The purpose of the sketch plan is to illustrate the applications of arterial street access control principles. It is not a final design. For final design, detailed studies of each driveway location and the traffic served will be needed. In the sketch plan no change has been shown for driveways that are in reasonable conformance with the desirable design standards.

The basic standards and guidelines used in preparing the sketch plan were:

- Minimum centerline-to-centerline spacing of driveways of 150 to 180 feet. That is the recommended minimum spacing for

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[1] Access Management for Streets and Highways, Federal Highway Administration, U.S. Department of Transportation, Report Number FHWA-IP-92-3, June 1982.

an arterial with an Average Daily Traffic (ADT) over 20,000 and an operating speed between 35 mph and 40 mph.

- Maximum use of one-way driveways or median divided two-way drives. This "directional" control of driveway movements minimizes the conflict between exiting and entering traffic. It also permits driveway traffic to enter or leave the highway with minimum interference to through traffic.

- The recommended geometric design standards for the one-way drives are:

  - 20 to 25 foot return radius
  - 20 to 25 foot driveway width

  Under normal conditions those dimensions will permit driveway speeds between 20 mph and 25 mph.

- The recommended geometric design standards for two-way drives are:

  - 20 foot return radius
  - 48 foot driveway width
  - 4 foot driveway median

A sketch of the basic one-way, one-lane driveway design assumed for the access management plan is shown in Figure 1. The standard two-way, two-lane drive design is shown in Figure 2. The basic standards and guidelines given above would require adjustments for application to higher volume driveways.

For both one-way and two-way drive applications, service drive traffic should yield to driveway traffic. In particular, service drive traffic approaching from the back right side of right turning vehicles should be signed to yield or stop. Where possible, drives should be designed to intersect flush with the mainline pavement rather than with an apron.

Left-turn bays for median breaks along Rockville Pike should be designed with a 300 foot reverse curve taper. This type of taper will provide maximum ease of flow into the turn bay and will preserve smooth mainline cruise speeds. The left-turn bay lengths should be designed to accommodate vehicle deceleration as well as vehicle storage requirements where possible.

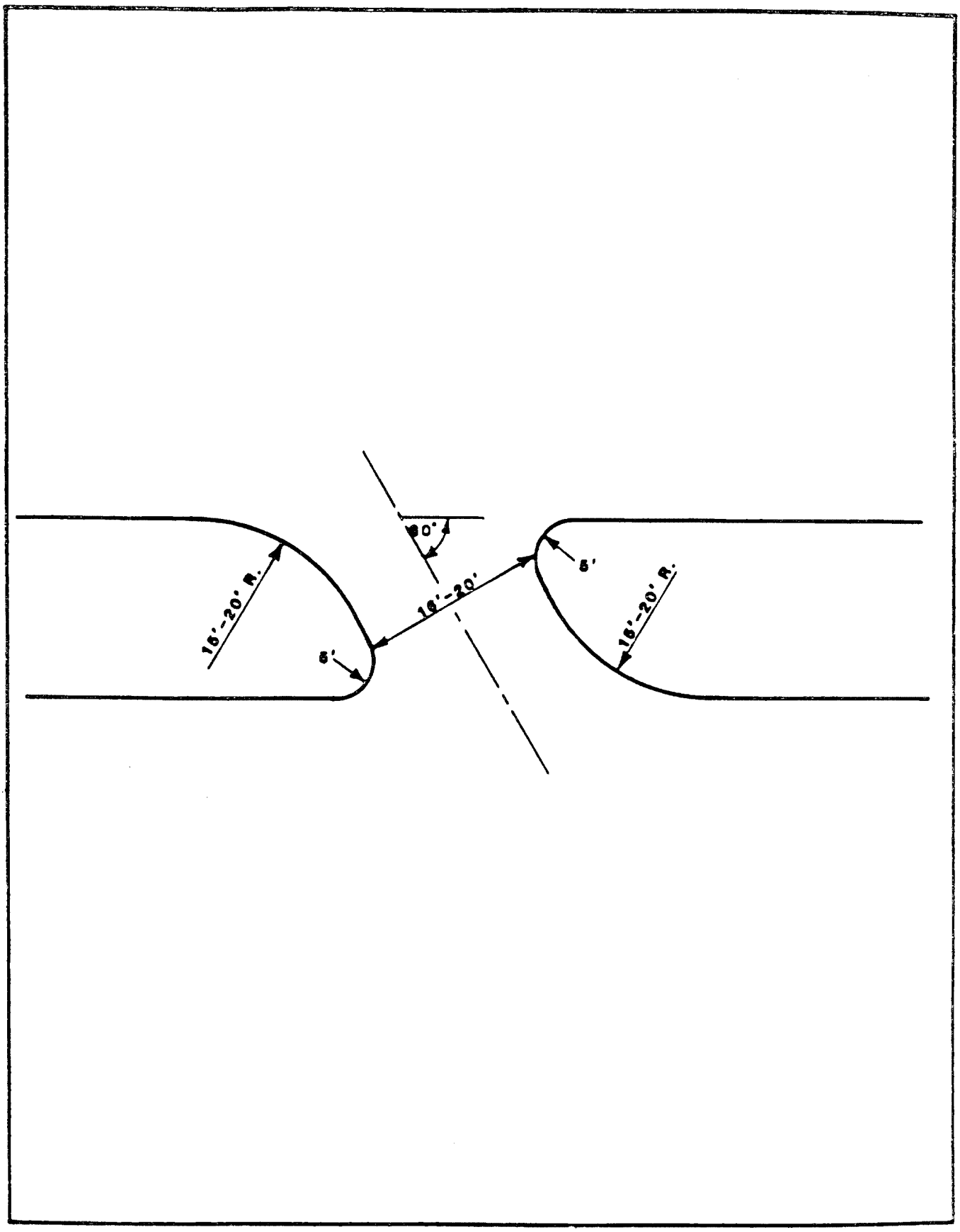


Figure 1. Standard Drive Design

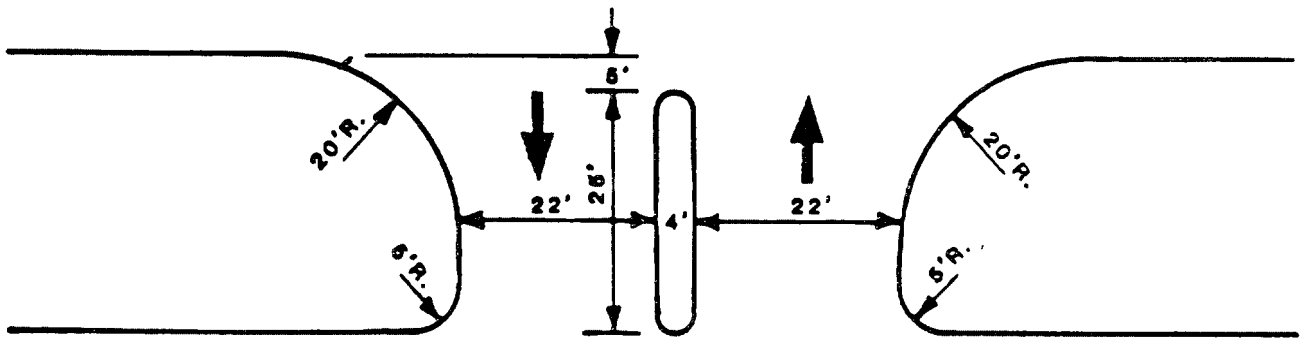
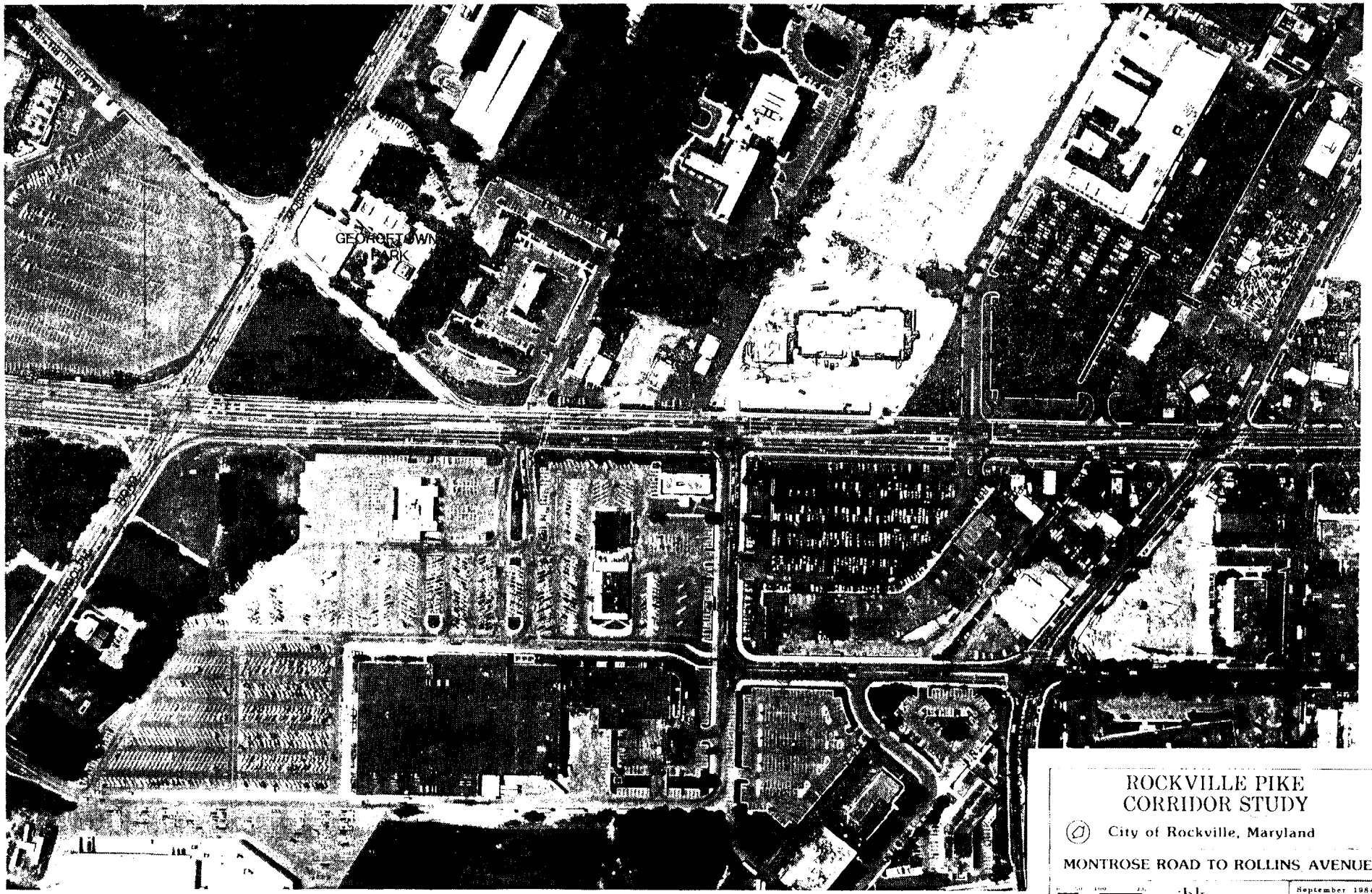


Figure -2. Standard Two-Way Drive Design



ROCKVILLE PIKE CORRIDOR STUDY

City of Rockville, Maryland

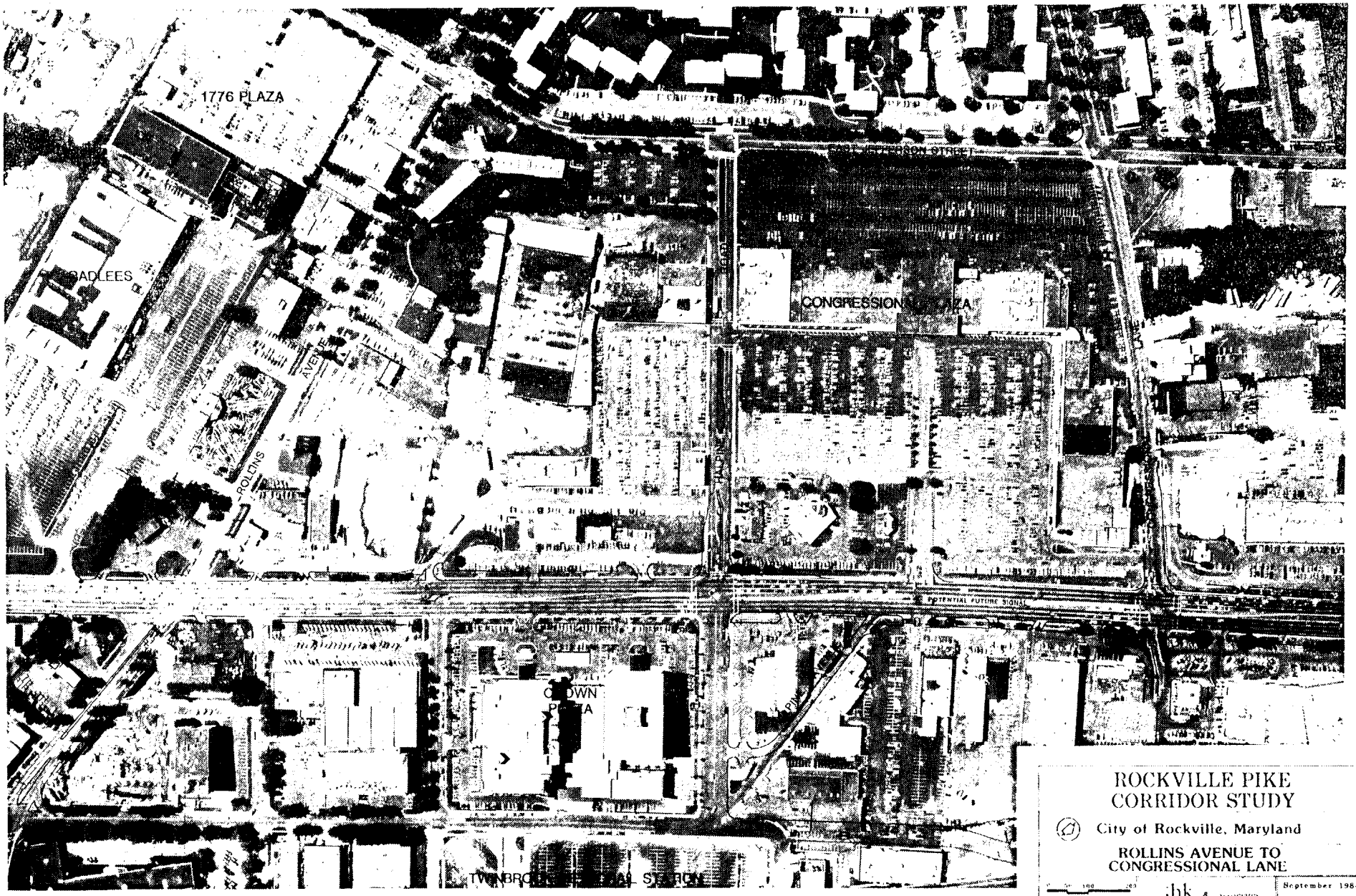
MONTROSE ROAD TO ROLLINS AVENUE

Scale in Feet

jhk & associates

September 1984

Sheet 1 of 7



ROCKVILLE PIKE CORRIDOR STUDY

City of Rockville, Maryland

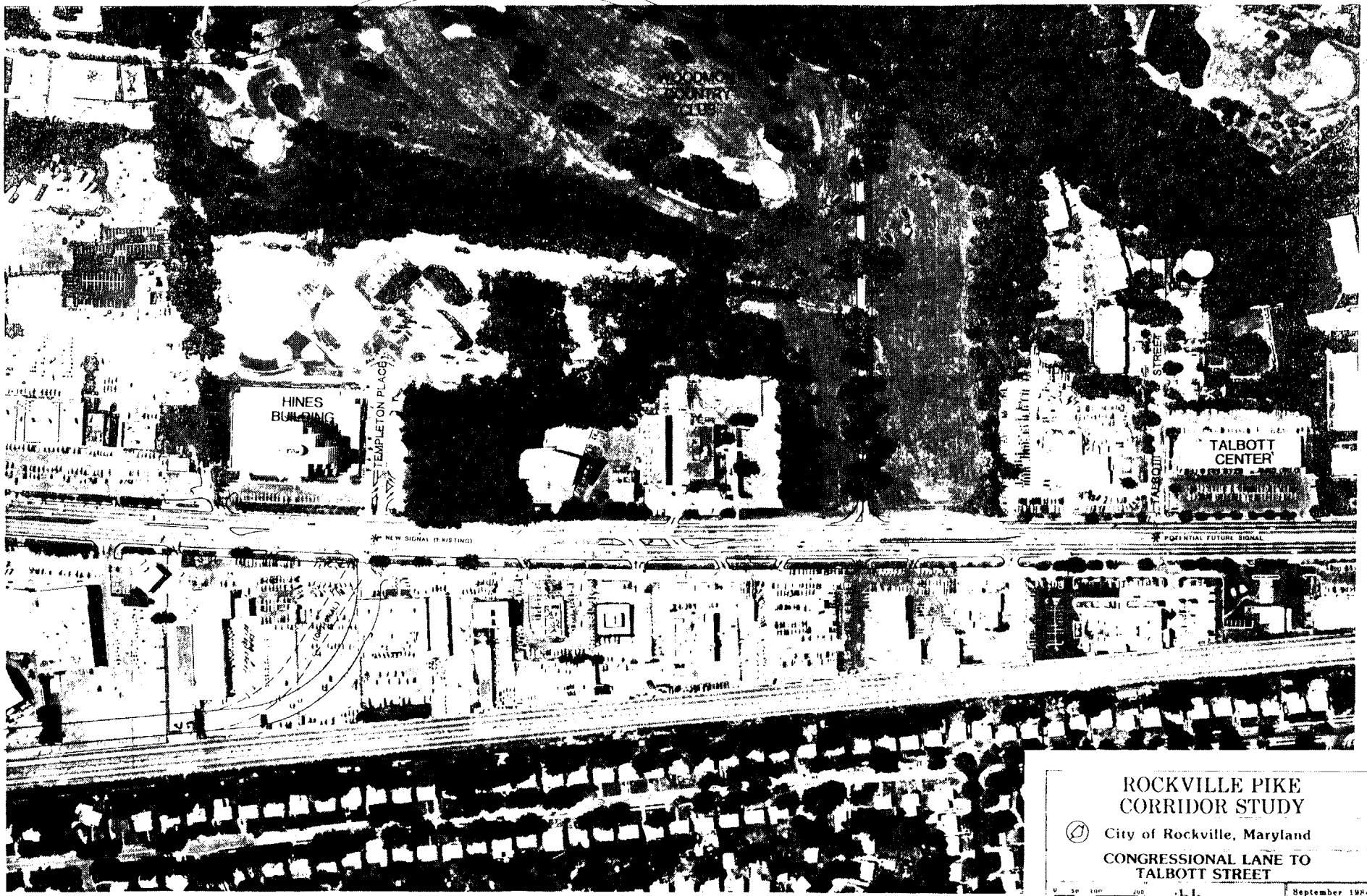
ROLLINS AVENUE TO CONGRESSIONAL LANE

Scale in Feet

hk & Associates

September 1984

Sheet 2 of 7



ROCKVILLE PIKE CORRIDOR STUDY

City of Rockville, Maryland

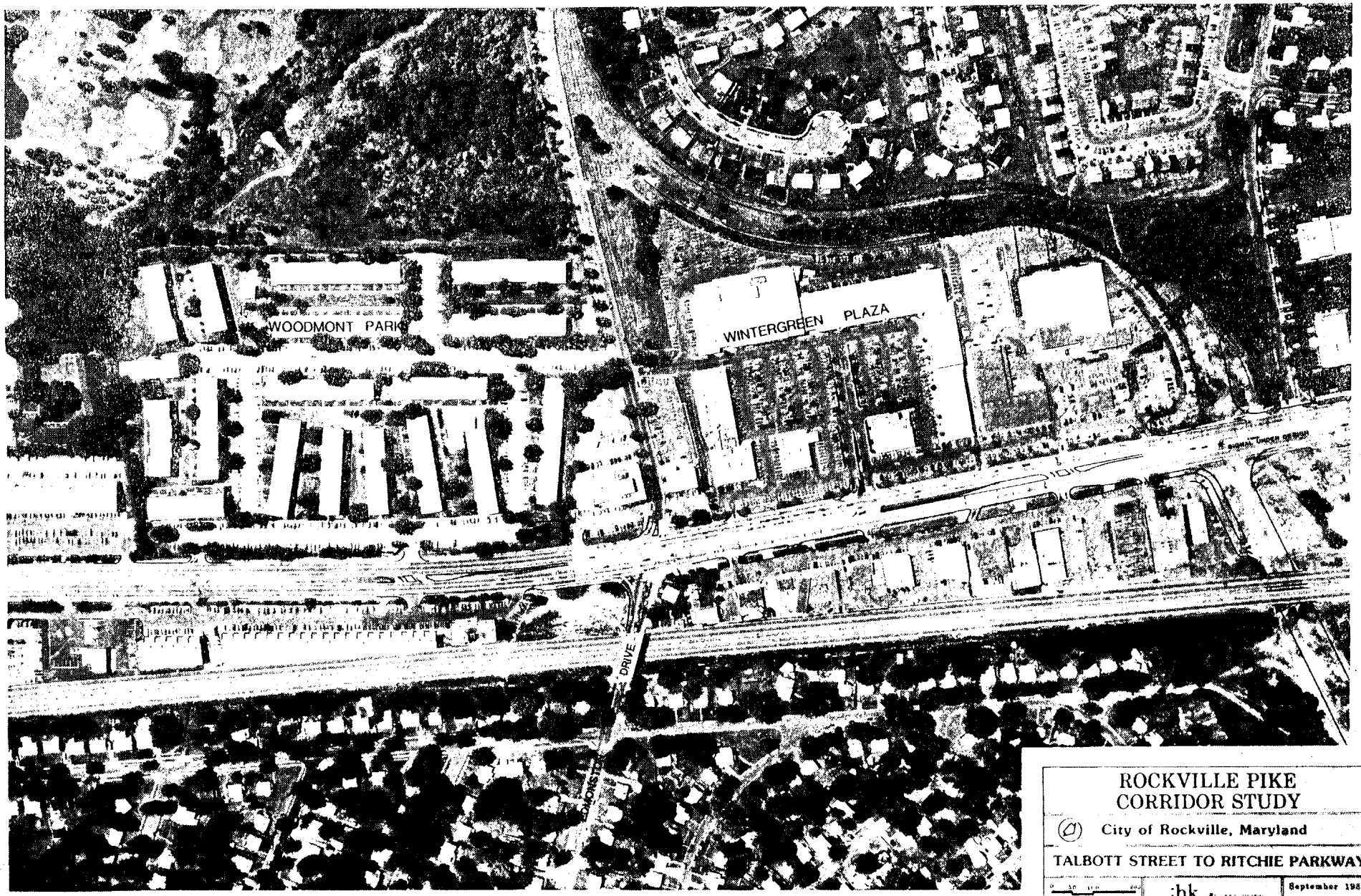
CONGRESSIONAL LANE TO TALBOTT STREET

Scale in Feet

jhk & associates

September 1984

Sheet 3 of 7



ROCKVILLE PIKE CORRIDOR STUDY

City of Rockville, Maryland

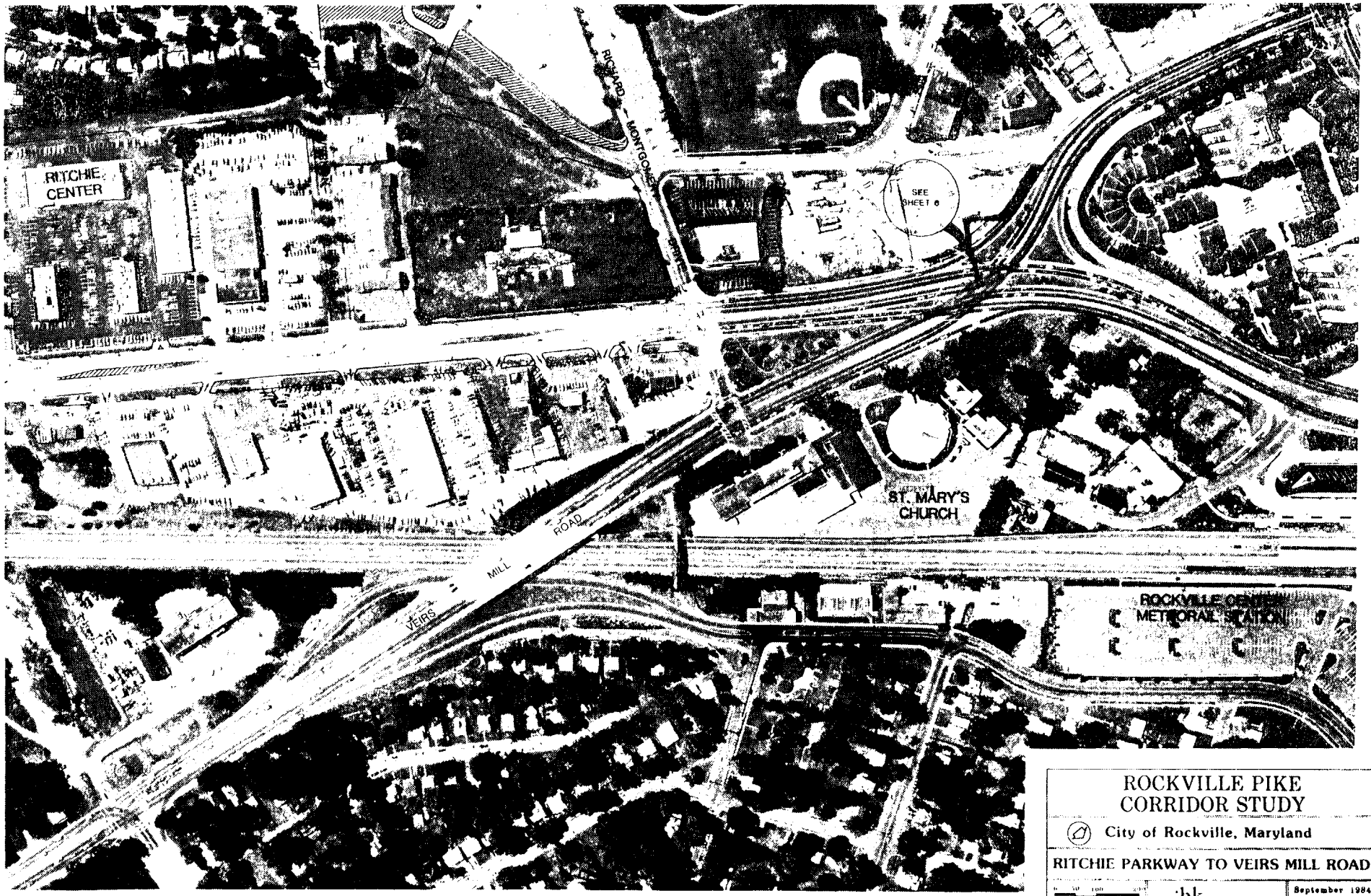
TALBOTT STREET TO RITCHIE PARKWAY

Scale in Feet

jhk & associates

September 1984

Sheet 4 of 7



ROCKVILLE PIKE CORRIDOR STUDY

City of Rockville, Maryland

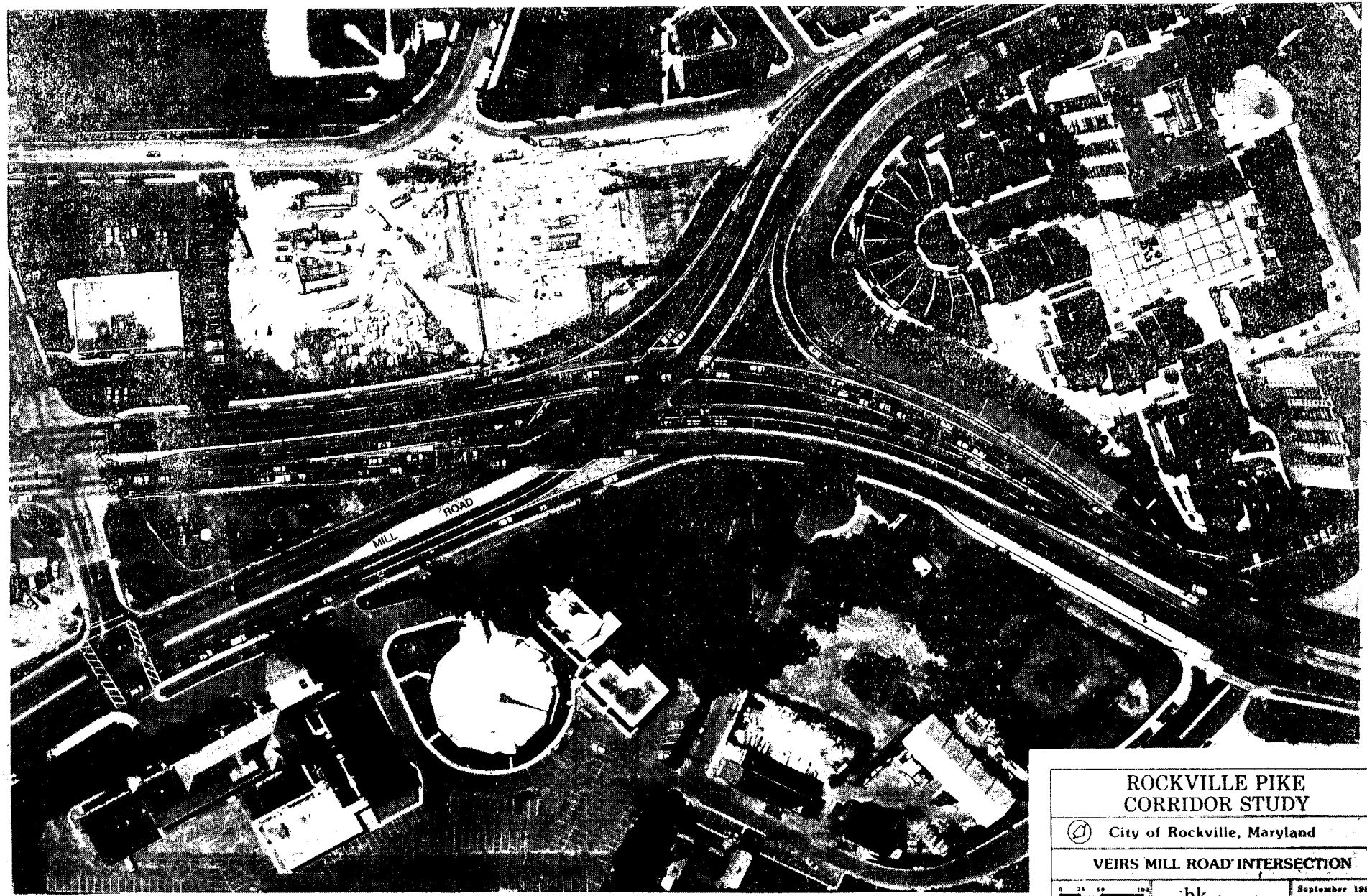
RITCHIE PARKWAY TO VEIRS MILL ROAD

Scale in Feet

jhk & associates

September 1984

Sheet 5 of 7



ROCKVILLE PIKE CORRIDOR STUDY

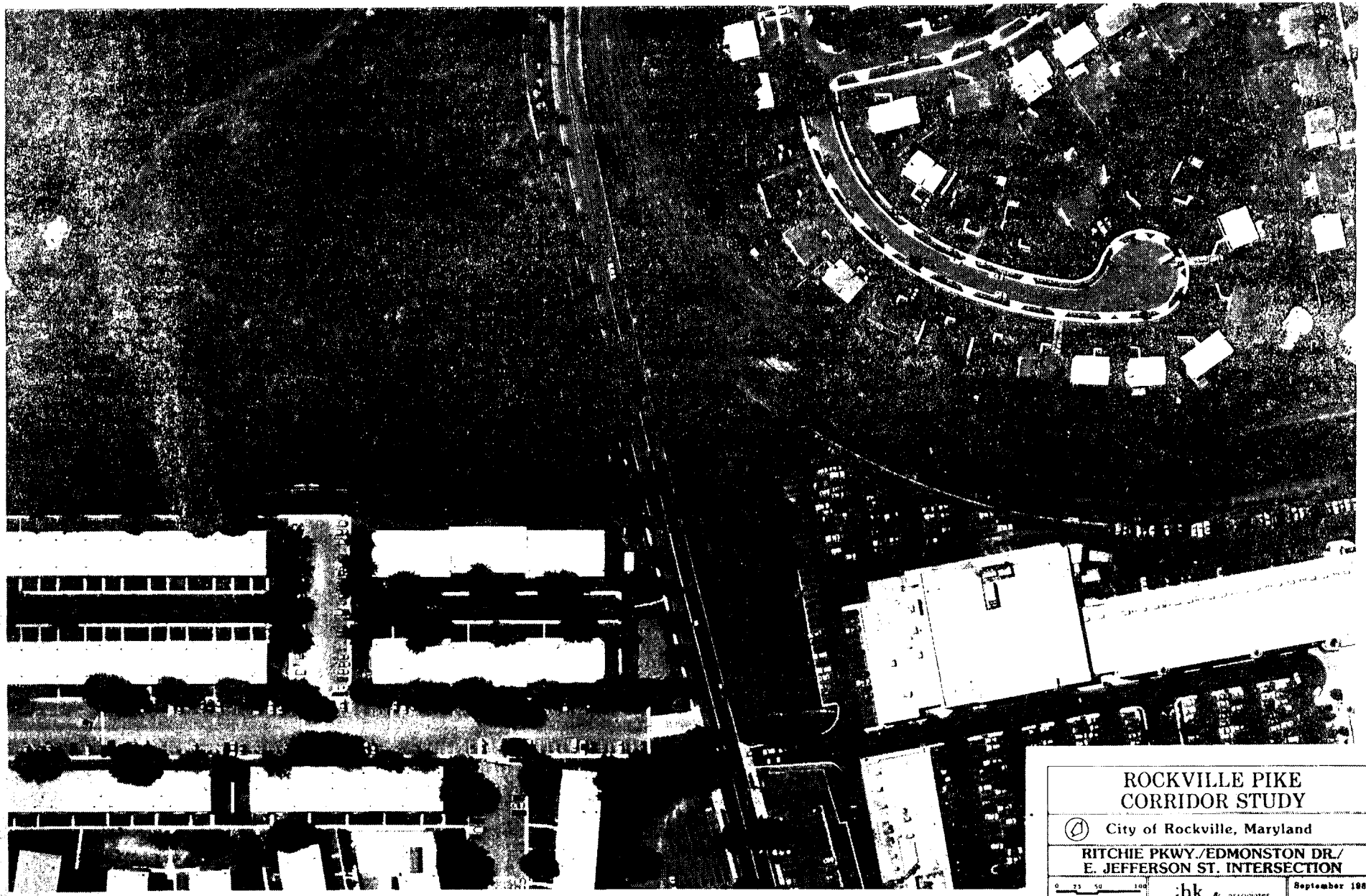
City of Rockville, Maryland

VEIRS MILL ROAD INTERSECTION

0 25 50 100
Scale in Feet

jhk & associates

September 1984
Sheet 6 of 7



ROCKVILLE PIKE CORRIDOR STUDY

City of Rockville, Maryland

RITCHIE PKWY./EDMONSTON DR./ E. JEFFERSON ST. INTERSECTION

0 75 50 100
Scale in Feet

jhk & associates

September 1984

Sheet 7 of 7

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